

Section 840

(C) Backfill

Complete endwall construction, and remove all forms. Backfill with approved material after the concrete or brick masonry has cured for at least 7 curing days unless otherwise permitted. A “curing day” is defined in Article 830-5. Within 4 calendar days after the completion of the 7 day curing period, shape, compact and complete backfill in accordance with the contract.

838-4 MEASUREMENT AND PAYMENT

Endwalls will be measured and paid in cubic yards of concrete or brick completed and accepted. This quantity will be computed from the dimensions shown in the plans or from revised authorized dimensions. Where precast concrete units have been approved and are used instead of cast-in-place units the quantity to be paid will be computed the same as if cast-in-place units were used, as no reduction in pay quantity will be made due to the use of precast instead of cast-in-place endwalls.

Reinforced Endwalls will be measured and paid in cubic yards of concrete or brick completed and accepted. This quantity will be computed from the dimensions shown in the plans or from revised authorized dimensions. Where precast concrete units have been approved and are used instead of cast-in-place units the quantity to be paid will be computed the same as if cast-in-place units were used, as no reduction in pay quantity will be made due to the use of precast instead of reinforced cast-in-place endwalls.

Payment will be made under:

Pay Item	Pay Unit
Endwalls	Cubic Yard
Reinforced Endwalls	Cubic Yard

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MINOR DRAINAGE STRUCTURES

840-1 DESCRIPTION

Perform the work covered by this section including, but not limited to, excavation; providing protection of employees in excavation; hauling; disposal of materials; removing existing pipe and drainage structures at the site of the work; furnishing, transporting and placing foundation conditioning material, backfill material, subsurface drainage, concrete, brick masonry, block masonry, precast units, mortar, grout, reinforcing steel, hardware, castings and miscellaneous metal; fabrication; welding; and galvanizing to construct cast-in-place concrete, brick masonry, block masonry or precast concrete inlets, catch basins, junction boxes, spring boxes, manholes, concrete aprons and other minor drainage structures excluding endwalls, with all necessary metal grates, covers, frames, steps and other hardware, in accordance with the contract.

Use cast-in place concrete, brick masonry, block masonry or precast concrete construction as shown on approved plans.

840-2 MATERIALS

Refer to Division 10.

Item	Section
Brick	1040-1
Concrete Block	1040-2
Curing Agents	1026
Fabricated Steel Grates	1074-9
Gray Iron Castings	1074-7
Joint Fillers	1028-1
Joint Sealers	1028-2

Item	Section
Mortar	1040-9
Precast Drainage Structure Units	1077
Portland Cement Concrete, Class B	1000
Reinforcing Steel	1070
Select Materials	1016
Steps	1074-8
Structural Steel	1072

1 Use grout in precast structures consisting of one part Portland cement to 2 parts of mortar
2 sand.

3 Use foundation conditioning material meeting Article 1016-3 for Class V or VI select material
4 as shown in the contract or as directed.

5 **840-3 CONSTRUCTION METHODS**

6 **(A) Excavation**

7 Perform excavation with equipment of adequate weight, size and capability. Where
8 necessary, provide a competent person and protection of personnel in excavation by
9 sloping, shoring or bracing in accordance with Federal, State or local standards and
10 Article 107-1.

11 **(B) Foundation**

12 Do not place masonry drainage structure until the foundation has achieved adequate
13 strength.

14 Where the foundation material is found to be of poor supporting value or of rock, minor
15 adjustments in the location of the structure may be approved to provide a more suitable
16 foundation. Where this is not practical, undercut the foundation and condition by
17 backfilling with an approved select material.

18 Set precast foundation slabs to within $\pm 1/2"$ of grade on a 2" to 3" thick bed of
19 compacted foundation conditioning material.

20 **(C) Cast-In-Place Concrete, Brick and Block Masonry**

21 Install drainage structures to plan line and grade or approved to meet drainage conditions.
22 Do not modify the drainage structure by corbeling or use of concrete slabs unless
23 otherwise directed.

24 Construct concrete in accordance with Section 825 and give an ordinary surface finish.
25 Construct brick masonry in accordance with Section 830. Construct block masonry in
26 accordance with Section 834. Furnish and place reinforcing steel in accordance with
27 Section 425.

28 Obtain approval if field conditions necessitate a variance from the plan dimensions of the
29 structure or footings.

30 **(D) Installation of Precast Units**

31 Install drainage structures to plan line and grade or approved to meet drainage conditions.
32 Do not modify the drainage structure by corbeling or use of concrete slabs unless
33 otherwise directed.

34 Assemble the precast drainage structure units in accordance with the manufacturer's
35 instructions. Subarticle 840-3(C) applies where it is necessary to use cast-in-place
36 concrete, brick masonry or block masonry construction as part of the structure. Fill any
37 void greater than 1" with a brick or block bat fully encased in mortar.

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Obtain approval if field conditions necessitate a variance from the plan dimensions of the structure or footings.

(E) Fittings and Connections

As the work is built up, accurately space, align and thoroughly bond fittings that enter the structure.

Make pipe connections so the pipe does not project beyond the inside wall of the drainage structure and grout as necessary to make smooth and uniform surfaces on the inside of the structure.

Set metal frames for grates and covers in full mortar beds or secure by approved methods.

(F) Backfill

Complete drainage structure and remove all forms and falsework. Backfill with approved material, compacted to the density required by Subarticle 235-3(C), after the drainage structure has cured for at least 7 curing days, unless otherwise permitted. Define a "curing day" in accordance with Article 825-9 for concrete or Article 830-5 for brick or block masonry.

(G) Pipe Collars and Pipe Plugs

Construct pipe collars and pipe plugs in accordance with the details shown in the plans or as directed.

Use any class of Portland cement concrete contained within Section 1000 for pipe collars.

Construct pipe plugs with either brick masonry or any class of Portland cement concrete contained within Section 1000.

(H) Concrete Aprons

Construct concrete aprons in accordance with the details in the plans. Use Class B or higher compressive strength concrete.

840-4 MEASUREMENT AND PAYMENT

Masonry Drainage Structure that incorporate an opening for circular pipe not exceeding 48" in diameter will be measured and paid in units of each for the actual number completed and accepted.

Masonry Drainage Structure exceeding a height of 5.0 ft will be measured and paid in linear feet for the portion of the drainage structure exceeding a height of 5.0 ft. The height will be measured vertically to the nearest 0.1 ft from the top of the bottom slab to the top of the wall. For that portion of *Masonry Drainage Structure* measured above a height of 10.0 ft, payment will be made at 1.3 times the contract unit price per linear foot for *Masonry Drainage Structure*.

Masonry Drainage Structures that incorporate an opening for circular pipe exceeding 48" in diameter, or for pipe arch of any size, will be measured and paid on a volume basis as provided below.

Masonry to be paid will be the number of cubic yards of cast-in-place concrete brick or block that has been incorporated into the completed and accepted structure. This quantity will be computed from the dimensions shown in the plans or from revised dimensions authorized by the Engineer. Where the wall thickness is greater than the wall thickness shown in the plans due to the use of oversize brick or for any other reason, the wall thickness shown in the plans will be used to compute quantities except where an increase in wall thickness has been authorized by the Engineer.

- 1 *Pipe Collars* will be measured and paid in cubic yards of concrete or brick that has been
 2 incorporated into the completed work. The cubic yards of pipe collars will be computed from
 3 the dimensions shown in the plans or from revised dimensions authorized by the Engineer.
- 4 *Pipe Plugs* will be measured and paid in cubic yards of concrete or brick that has been
 5 incorporated into the completed and accepted pipe plug. The cubic yards of pipe plugs will be
 6 computed from the dimensions shown in the plans or from revised dimensions authorized by
 7 the Engineer.
- 8 *Frame with Grate and Hood, Std. ____* will be measured and paid in units of each for actual
 9 number of assemblies incorporated into the completed work. No separate measurement will
 10 be made of grates, hoods, and covers that are part of the assembly, as the grates, hoods and
 11 covers will be considered to be part of the complete assembly.
- 12 *Frame with Grate, Std. ____* will be measured and paid in units of each for actual number of
 13 assemblies incorporated into the completed work. No separate measurement will be made of
 14 grates, hoods, and covers that are part of the assembly, as the grates, hoods and covers will be
 15 considered to be part of the complete assembly.
- 16 *Frame with Two Grates, Std. ____* will be measured and paid in units of each for actual
 17 number of assemblies incorporated into the completed work. No separate measurement will
 18 be made of grates, hoods, and covers that are part of the assembly, as the grates, hoods and
 19 covers will be considered to be part of the complete assembly.
- 20 *Frame with Cover, Std. ____* will be measured and paid in units of each for actual number of
 21 assemblies incorporated into the completed work. No separate measurement will be made of
 22 grates, hoods, and covers that are part of the assembly, as the grates, hoods and covers will be
 23 considered to be part of the complete assembly.
- 24 *Steel Frame with Two Grates, Std. ____* will be measured and paid in units of each for the
 25 actual number of fabricated steel grates incorporated into the completed work.
- 26 No separate payment will be made for concrete aprons shown in *Roadway Standard Drawings*
 27 No. 840.17, 840.18, 840.19, 840.26, 840.27 and 840.28, as this work will be incidental to the
 28 other work in this section.
- 29 *Foundation Conditioning* will be paid as provided in Article 300-9.
- 30 The above prices and payments will be full compensation for all work covered by this section.
- 31 Payment will be made under:

Pay Item	Pay Unit
Masonry Drainage Structures	Each
Masonry Drainage Structures	Linear Foot
Masonry Drainage Structures	Cubic Yard
Pipe Collars	Cubic Yard
Pipe Plugs	Cubic Yard
Frame with Grate and Hood, Std. ____	Each
Frame with Grate, Std. ____	Each
Frame with Two Grates, Std. ____	Each
Frame with Cover, Std. ____	Each
Steel Frame with Two Grates, Std. ____	Each